Vincent Souveton, Ph.D. in Applied Mathematics

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Employment / Community life / Responsabilities

2024 – Present — **Postdoctoral researcher, CEA.** Statistical learning algorithms for fast computation of wave propagation effects.

2021 – 2024 — **PhD student, UCA.** Study and development of sampling algorithms for cosmology.
– As part of my Ph.D., I have been giving tutorials to first-year science students in two different courses.
Mathématiques S2: *asymptotic analysis and Taylor expansion, vector spaces, linear applications, sequences.*
Outils Mathématiques 2: *logic and reasoning, functions of multiple variables, ordinary differential equations.*
– I was elected a Ph.D. student representative at the Doctoral School (May 2022 - November 2023). I have also participated in actions to combat psychosocial hazard, as well as sexist and sexual violence.
– In charge of the laboratory Ph.D. seminar organization for two years.

Jan. - June 2021 — **Master's degree internship, UCA.** Interdisciplinary research internship between applied Mathematics and Cosmology. My work consisted in a bibliography search and I produced theoretical results regarding the convexity analysis of a sampling problem.
Thesis title: *Mathematical aspects in statistical inference of initial cosmological parameters through forward modeling.*

2020 – 2021 — **Tutoring, UCA.** The job consisted in helping first year science students with their math homework and guide them through efficient preparation for the exams.

July 2018 — **Volunteer, Archelon.** This Greek NGO aims at the protection of sea turtles. I was in charge of patrolling the beaches, raising public awareness, and participating in the daily life of our international camp based in Matala (Crete).

Education

2021 – 2024 — **Ph.D., Applied Mathematics, Université Clermont Auvergne.** The goal of my PhD was to study and develop algorithms to extract meaningful information from astronomical surveys for characterizing the large scale structure of the Universe. I explored both Machine Learning techniques and non-reversible Monte Carlo methods.
Thesis title: *Non-reversible and generative sampling algorithms. Application to the inference of cosmological parameters.*

2019 – 2021 — **M.Sc., Mathematics, UCA.** Various courses in both fundamental and applied Mathematics. Specialization in Partial Differential Equations during the last year.
1st year thesis title: *Holomorphic functions on the disk and Aleksandrov-Clark measures.*
2nd year thesis title: *Mathematical aspects in statistical inference of initial cosmological parameters through forward modeling.*

2017 – 2018 — **Ensai Rennes.** National school for Statistics and data analysis. I chose to leave after one year and a half to focus on a research-oriented education in both fundamental and applied Mathematics.

Education (continued)

2015 – 2017 **Classes préparatoires MPSI/MP*, Lycée Blaise Pascal, Clermont-Fd.** Preparatory years for nationwide competitive examination to the French schools of engineering.

2015 **Baccalauréat scientifique, Lycée Jeanne d'Arc, Clermont-Fd.** With very high honours.

Research Publications

Conference Proceedings

1 V. Souveton, A. Guillin, J. Jasche, G. Lavaux, and M. Michel, "Fixed-kinetic neural Hamiltonian flows for enhanced interpretability and reduced complexity," in *Proceedings of The 27th International Conference on Artificial Intelligence and Statistics*, S. Dasgupta, S. Mandt, and Y. Li, Eds., ser. Proceedings of Machine Learning Research, vol. 238, PMLR, Feb. 2024, pp. 3178–3186. URL: https://proceedings.mlr.press/v238/souveton24a.html.

Ph.D. Thesis

1 V. Souveton, "Non-reversible and generative sampling algorithms. Application to the inference of cosmological parameters," Theses, Université Clermont Auvergne, Sep. 2024. URL: https://theses.hal.science/tel-04779691.

Talks, Posters

05/03/2024 *Fixed-kinetic NHF for enhanced interpretability and reduced complexity.* Poster presentation at AISTATS conference (Valencia).

04/11/2024 *Sampling algorithms for cosmology.* Seminar presentation at CEA DAM-DIF (Bruyères-le-Châtel).

11/28/2023 *Sampling with Neural Hamiltonian Flows.* Flashtalk at Institut d'Astrophysique de Paris during the "Debating the potential of Machine Learning in astronomical surveys" conference (Paris).

11/22/2023 *Introduction to Geometric Deep Learning.* Presented at the PhD students seminar in Laboratoire de Mathématiques Blaise Pascal (Clermont-Ferrand).

11/07/2023 *Algorithms for inferring the initial conditions of the Universe.* Talk as part of an interdisciplinary public colloquium called "Le Puy de la Recherche" (Clermont-Ferrand).

09/20/2023 *Sampling with Neural Hamiltonian Flows.* Talk during the workshop "Probabilistic sampling for physics: finding needles in a field of high-dimensional haystacks" at Institut Pascal (Orsay).

12/15/2022 *Sampling with Hamiltonian Normalizing Flows.* Presented at the Simatlab seminar as part of a scientific collaboration between Université Clermont Auvergne and Michelin.

Talks, Posters (continued)

11/25/2021 — *Inferring the initial conditions of the Universe.* Presented at the Cosmology group seminar at the Oskar Klein Center (Stockholm).

Skills

Languages	French (native speaker), English (full professional capacity) and Spanish (basis).
Coding	Python/PyTorch, Julia, LaTeX.
Web Dev	Basic knowledge of HTML and MarkDown.
Misc.	Driver's license.